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ABSTRACT

Six life skills students with varied mental disabilities at Eastern High School in a Pennsylvania school district received mathematics instruction through the use of a PLATO computer-assisted instruction program for mathematics. The purpose of this evaluation was to determine whether the use of computer-assisted instruction increased the student's interest and time on task in mathematics. Results of observations and interviews of students suggest that the use of computer-assisted instruction clearly increased students' interest in mathematics. (Contains 18 references.) (SLD)

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Evaluation Series

Eastern High School
Life Skills Class

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Executive Summary

Six life skills students with varied mental disabilities received math instruction through the use of PLATO computer-assisted instruction program for math. The purpose was to determine whether the use of computer-assisted instruction increased the student's interest and time on task in math. The results suggest that the use of computer assisted-instruction clearly increased student's interest in math.

Keywords: PLATO, CAI, Secondary, Mentally Retarded, Life Skills, Technology, Evaluation

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Eastern High School

Editor's Note: This study uses a qualitative methodology to address the issue of effects of PLATO's Math Fundamentals curriculum with a small group of mentally retarded learners. Programs for these learners generally do not use standardized tests, and thus typical quantitative evaluation methodologies are not an option. Studies of the effectiveness of CAI with learners of this type are rare, however, so we are publishing this report.

Introduction

In the last twenty years, computers have become ubiquitous in today's society. A person can barely get through a day without utilizing some sort of microchip technology. One area that has seen a great deal of promise in utilizing computer technology is the field of education. Computer assisted instruction (CAI) has been around since the early Sixties. Many studies have been conducted as to the efficacy of CAI and its ability to instruct students; however, very few studies have been conducted to determine the effectiveness of CAI and its ability to instruct mentally handicapped students. This research study will set out to ascertain whether or not CAI is a viable means of instructing mentally retarded students.

Most mentally handicapped students lack basic math skills, and this shortcoming is a major obstacle to their overall success in mathematics and ultimately in life. As mentally handicapped children get older, they fall further and behind non-handicapped peers when they are asked to recall information (Hasslebring et al, 1988). With the ability of CAI to deliver focused, individual instruction, it would be hoped that mentally handicapped students would be able to increase their basic skills and advance to more difficult learning tasks. For example, if a student is able to readily recall simple mathematical knowledge, that student will be better equipped to handle more difficult mathematical problems.

The purpose of this study was to determine whether or not PLATO's CAI in math is effective for life skills high school students. PLATO's tutorial CAI is as a computer program that employs a tutorial, drill, and mastery test format[1]. Effectiveness was determined by an increased interest in math and increased time on task in math. Life skills students are special education students whose disabilities include mental retardation, cerebral palsy, and Down's Syndrome.

[1] Other parts of PLATO use a wide range of additional instructional models, such as problem-solving activities. However, they were not included in this study.

This research study is significant on several levels. One, it will be assumed that if PLATO CAI is effective in teaching math to this life skills class, then it will be assumed that any life skills class would find this program effective. Two, this study will determine whether PLATO is effective in increasing the time on task in math for life skills students. Three, if PLATO is successful in this setting, then the program should be of use to other life skills teachers.

LITERATURE REVIEW

There are many noted benefits of utilizing CAI in the classroom. Early CAI programs were used primarily for reinforcement purposes. As CAI programs have evolved, they have been developed to teach students with disabilities. CAI, when well-designed and routinely applied in classrooms, has the potential to reinforce teacher instruction and provide additional teaching to increase practice time (Hall et al., 2000; Hasselbring et al., 1988).

Educators and researchers in special education have seen a positive impact by using educational technology for students with disabilities. In a meta-analysis of literature pertaining to the effectiveness of CAI, Hall et al. found that 13 of 17 studies showed positive increases in student learning where CAI was utilized (2000). Hasselbring et al. found that, when properly implemented, CAI is a highly effective method of instructing mentally handicapped students (1988). Hitchcock and Noonan found CAI to be a more effective method of instructing mentally disabled students over teacher-assisted instruction (2000).

Researchers have learned that computers have the ability to deliver, "motivating, carefully monitored, individualized.... practice in concentrations far beyond those available in traditional instructional format" (Hall et al., 2000). In addition, the methods of instruction most commonly used to teach special education students—individualized instruction, drill and practice, and immediate feedback—are typical features of CAI (Schmidt et al., 1985-86). CAI allows students to be assigned additional instructional time to provide teaching and practice in a particular skill area with minimal direct instruction from the teacher (Hall et al., 2000).

Schmidt et al. cite many reasons why CAI is an effective medium of instruction. Some of these explanations include: a secure one-on-one learning environment, truly individualized programs of learning, prompt and immediate feedback, mathematical and linguistic modeling, and a multisensory learning environment that includes visual and auditory stimuli (1985-86).

Hitchcock and Noonan discovered that CAI is an effective method of building academic skills in preschoolers with disabilities. They found that CAI was more effective in teaching basic skills than teacher-assisted instruction. In addition, they discovered that students with mild disabilities learned twice as much through CAI than conventional methods (2000).

There are several reasons that CAI is deemed to be more effective than traditional direct teacher instruction. CAI, by its design, can be adapted to the different levels of instruction with exceptional children (Schmidt et. al., 1985-86). Computers are also motivating to students (Hall et al., 2000). Hitchcock and Noonan discovered that students frequently asked to use the computer-assisted programs (2000). One reason that CAI is motivating may be because it is an attractive and engaging learning medium. In addition, students remain on task for longer periods when they are able to control the activities on the screen (Hitchcock and Noonan, 2000; Harrison et. al., 1998).

The ability of CAI such as PLATO to be adapted to the individual learner is one positive aspect of CAI. Using the management system employed in some CAI programs, a teacher is able to carefully assign lessons that are appropriate for each individual learner. The learner is then free to work on his or her assignments in a private setting until the objectives of the particular lesson are mastered.

CAI such as PLATO also provides immediate corrective feedback or immediate positive reinforcement to the learner. Immediate corrective feedback that instructs the students as to the source and cycles the student through more practice has been found to be highly effective (Hall et al., 2000).

In spite of all the literature available on the topic of CAI and its effectiveness, very little of this literature focuses on CAI and mentally retarded students. Hitchcock and Noonan noted that few studies have been done to evaluate whether CAI is more effective than tradition methods of teaching learners with disabilities (2000). It is therefore the purpose of this study to add to the body of literature dealing with CAI and mentally retarded students.

DESIGN AND METHODOLOGY

This study focused on six students in the high school Life Skills class from the Eastern High School[2] in a Pennsylvania School District. They are 5 boys and 1 girl. Peter, a 16 year old boy with Downs Syndrome, is able to add one digit numbers. Paul, a 17-year-old boy who suffers from cerebral palsy and mental retardation, is able to work effectively with money and can do addition, subtraction, and basic multiplication. Andre, a 16-year-old boy with Downs Syndrome, is able to do basic addition and subtraction of one digit numbers. June, a 15-year-old girl with mental retardation, can add and subtract one digit numbers. Howard, a 17-year-old boy is mentally retarded, is able to perform two-digit addition and subtraction. Juan, a 15-year-old boy who is mentally retarded, can perform two digit addition and subtraction. The time frame of the study was from the beginning of April 2001 to the beginning of May 2001.

CAI, for the purpose of this study, is defined as software designed to teach toward a curricular goal, to provide instruction and practice toward the achievement of an immediate learning objective (Posgrow, 1990). The PLATO Math Fundamentals curriculum was used in this study. Data collection included field observations in the beginning of April and the beginning of May. The amount of time on task by each student was recorded for both observations. Individual student interviews also were conducted. During these interviews, the students were asked about their feelings and attitudes about doing math. These interviews will again take place at the beginning and end of the study time frame.

The criterion for assessing whether or not PLATO is effective in math for life skills students will be based on the following. If the amount of time on task has increased by ten minutes from the beginning of the study to the end, then PLATO is effective. If comments about math by students have changed and are clearly positive, then PLATO is effective. If both are true, then PLATO improves time on task and interest in math for high school life skills students.

[2] Names of the school and the learners have been changed to protect their privacy.

RESULTS

During my first observation of the students, I interviewed each student in private to attempt to gain a feel for each student's attitude toward math and computers. Four of the six students said they enjoyed math. When asked if they enjoyed doing math worksheets, three out of six students said they enjoyed doing math worksheets. Juan, a student who responded negatively toward worksheets, said, "As soon as you are done one, [the teacher] gives you another one." Another student responded that worksheets are, "boring." Paul's answer was mixed. He stated that he liked doing worksheets, but that they got boring after a while.

When asked whether students enjoyed using a computer, all responses were very positive. June remarked that she "loved using the computer." All students use a word processing program daily to type a short five-sentence paragraph that they write in the morning. The students also enjoy using the Internet and playing computer games. Students are currently being instructed how to use email.

When the students were asked to project whether or not they believe they would enjoy doing their math assignments on the computer, all but two responded affirmatively.

To collect the data for time on task, I observed the students doing math and recorded every minute of time on task. However, it was difficult to ascertain an accurate time on task. Some students were pulled to go with specialists, some students had to go to work, and others had to run other errands. What I found was that the students worked for an average of 19.8 minutes on their math assignment. The teacher had to redirect students to remain on task at frequent intervals.

During my second round of interviews, the students felt much differently about their math than during the first interview. All students who participated in this research project reported a positive experience using CAI to complete their math work. Paul told me "It is easier. It tells you what to do." When asked to be more specific, it was determined that he liked the immediate corrective feedback if he got a question wrong and the positive feedback when he answered a question correctly. Juan also stated that he liked the corrective feedback and positive rewards built into the program. Howard noted that he liked CAI because if he got a question wrong, the program instructed him how to answer the problem

correctly and then gave him another chance to answer the problem correctly.

The teacher noted some of the comments made by the students. She told me that some of her students were beginning to understand their addition better by being introduced to an addition table through the program. Howard said, "Look how else you can do this problem," referencing the addition table. The students found the color graphical interface to be both stimulating and engaging. Paul stated that he "liked the pictures." When asked if they felt that they were spending more time doing math with CAI, all students responded that they were spending more time on their math assignments.

I also asked each student if they could tell me one new thing they learned by using the computer. Paul told me he learned how to borrow in subtraction. Juan said he learned how to carry while doing addition. Howard found the addition table to be useful.

Standard reports that are included as part of the PLATO system were run to determine the amount of time each learner spent on task. The results of these reports are inconclusive due to computer problems. The PLATO system tracks time on task from the moment the student enters a lesson and does not have the capability to actually track keystrokes as a way to track time. The students had a per session average of 16.9 minutes to 60.9 minutes. These numbers will be elaborated on in the discussion section.

DISCUSSION

The results of this study suggest that the use of PLATO in a life skills class is effective. In analyzing the students' comments, they were all clearly positive in regards to completing their math on the computer versus doing worksheets. The teacher also reported that the students would ask her to be able to use computer to complete their math work even when it was not math time. This clearly indicates that PLATO raised interest level in math for life skills students.

The results of the time on task were not as clear. During my initial observation, the students worked on their math worksheets for an average of 19.8 minutes. The time on task reports that were generated by the PLATO program showed students working for times up to one hour. I was, initially, pleasantly surprised by these results until the teacher informed me that these times were not accurate due to computer problems. She told me that she would not log the students out because they would sometimes have troubles logging back on to the system. Since the PLATO program tracks time on task from the moment they log on, this is the reason some students have upward of one hour of continual time on task. It is therefore impossible for me to determine actual time on task for each student's PLATO session.

What this study did conclude is that PLATO does have a positive affect on life skills students' attitudes toward their math work. If the students have more interest in math, then they will be more inclined to complete their math tasks and therefore will become better prepared to handle math in their lifetimes. It is uncertain whether the CAI program used actually increased the students' time on task due to the inaccuracies uncovered in the reporting process.

There are some limitations that will impact the generalizability of these results. The inaccurate time on task has obvious effects on the outcome of this study. The limited sampling, using only six students, will also limit the degree to which these results can be generalized to other life skills students. The time frame in which this study was conducted will also have negative effect on the results. Another limitation will be the teacher's input to assist students while working with the computer program. If the teacher offers assistance too quickly, this could shortcut the program's ability to effectively instruct the students. A longer period of time in which to conduct the study would produce more meaningful results.

CONCLUSION

This study set out to determine whether PLATO CAI is effective in math for life skills high school students. PLATO had a definite positive impact on the students' attitudes toward math. After PLATO was implemented in the classroom, all students reported an improved, more positive attitude toward math. Due to the manner in which the program was left on when students were not in the room, it is unclear whether or nor PLATO increased time on task for high school life skills students in math. The results of this project, while promising, are not clearly definitive.

It is recommended that more research be done in this field. Since the results of this research study are not definitive, more research needs to be done to determine the effectiveness of using PLATO with life skills students. It is also recommended that future studies sample a larger population to make the results easier to generalize. Future samplings should also be done over a longer period of time to allow for increased interaction between the learners and the PLATO program utilized.

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